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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/581,664

06/05/2006

Koji Hotta

12394/3

4560

23838 7590 01/20/2010

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EXAMINER

SANDVIK, BENJAMIN P

ART UNIT

PAPER NUMBER

2826

MAIL DATE

DELIVERY MODE

01/20/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/581,664	Applicant(s) HOTTA ET AL.	
	Examiner BENJAMIN P. SANDVIK	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 15-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15-17 and 20-27 is/are allowed.
- 6) ☒ Claim(s) 18 and 19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claim 18 have been considered but are moot in view of the new ground(s) of rejection to address the new limitations. In particular, it appears that if the n-type region 3 is characterized as the deep region of claim 18 then the Tomatsu reference teaches each limitation in the claim. Applicant's arguments with respect to claim 20 are persuasive and all rejections of claims 20-27 have been removed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 18 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Tomatsu et al (U.S. Patent #5998268).

With respect to **claim 18**, Tomatsu teaches an emitter electrode (Fig. 2, E/17 and Col 4 Ln 20); a top region of a second conductivity type connected to the emitter electrode (Fig. 2, 8; N-type); a deep region of the second conductivity type (Fig. 2, 3); an intermediate region of a first conductivity type connected to the emitter electrode (Fig. 2, 7), the intermediate region isolating the top region and the deep region; a collector region of the first conductivity type connected to

the deep region, the collector region being isolated from the intermediate region by the deep region (Fig. 2, 2; P-type); a collector electrode connected to the collector region (Fig. 2, C/18); a gate electrode (Fig. 2, 11) facing a portion of the intermediate region via an insulating layer (Fig. 2, 10), the portion of the intermediate region isolating the top region and the deep region; and a barrier region (Fig. 2, 13; P-type) comprising a semiconductor region of the first conductivity type formed within the intermediate region; wherein the barrier region has a higher concentration of impurities than the intermediate region (Fig. 2, region 13 is P+ and region 7 is P-), and the barrier region is formed along a boundary between the top region and the intermediate region (Fig. 2, regions 8 and 7), and is electrically connected to the emitter electrode (Fig. 2, 17).

With respect to **claim 19**, Tomatsu teaches that the thickness of the top region (Fig. 2, 8) is less than the thickness of the barrier region (Fig. 3, 13).

Allowable Subject Matter

Claims 15-17 are allowed. The following is a statement of reasons for the indication of allowable subject matter: the best prior art of record does not teach or fairly suggest the claimed device having a second conductivity type barrier region formed in the intermediate region and in contact with a dense portion.

Claims 20-27 are allowed. The following is a statement of reasons for the indication of allowable subject matter: the best prior art of record does not teach or

fairly suggest the IGBT of claim 20, specifically having a plurality of barrier regions, each comprising a semiconductor region of the second conductive type.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **BENJAMIN P. SANDVIK** whose telephone number is (571)272-8446. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2826

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. P. S./
Examiner, Art Unit 2826

/Sue A. Purvis/
Supervisory Patent Examiner, Art Unit 2826